

WHAT IS CLAIMED IS:

1. A color combining optical system for combining color light reflected by a dichroic film and color light transmitted through the dichroic film, wherein an optical thickness of the dichroic film increases or decreases from one end side to the other end side in an inclining direction of the dichroic film with respect to an incident optical axis of the color light reflected by the dichroic film.

2. A system according to claim 1, wherein a thickness of the dichroic film increases or decreases from one end side to the other end side in the inclining direction.

3. A system according to claim 1, wherein a refractive index of the dichroic film increases or decreases from one end side to the other end side in the inclining direction.

4. A system according to claim 1, wherein the optical thickness of the dichroic film increases as an incident angle of the reflected chromatic light on the dichroic film increases.

5. A system according to claim 1, wherein said optical system comprises a color combining prism, and

the dichroic film is formed at the inside of said color combining prism.

5 6. A system according to claim 5, further comprising a positive refracting optical element which has a positive refractive power and causes the reflected color light to be incident on said color combining prism.

10 7. A system according to claim 6, wherein said color combining prism is joined to said positive refracting optical system.

15 8. A system according to claim 6, wherein said color combining prism and said positive refracting optical element are integrally formed.

20 9. A system according to claim 5, wherein said color combining prism incorporates two dichroic films for reflecting different color light beams, and an optical thickness of at least one of the two dichroic films increases or decreases from one end side to the other end side in the inclining direction.

25 10. A system according to claim 9, wherein the two dichroic films are formed so as not to cross each other within said color combining prism.

11. A system according to claim 9 or 10, wherein
said color combining prism comprises three prisms.

12. A system according to claim 9 or 10, wherein
5 said color combining prism comprises four prisms.

13. A system according to claim 12, wherein two
prisms are arranged between two dichroic films.

10 14. A system according to claim 5, wherein
said color combining prism includes a plurality of
prisms, and

a prism, of the plurality of prisms, which is
located nearest to an exit side has at least three
15 optically flat surfaces, and an exit surface also
serves as a totally reflecting surface.

15. A system according to claim 5, wherein
said color combining prism sequentially includes,
20 from an exit side,

a first prism having at least three optically flat
surfaces, with an exit surface also serving as a
totally reflecting surface,

a second prism having at least three optically
25 smooth surfaces, and

a third prism having at least two optically smooth
surfaces, and

two dichroic films which reflect different color light beams are arranged between said respective prisms so as not to cross each other.

- 5 16. A system according to claim 5, wherein
 said color combining prism sequentially includes,
 from an exit side,
 a first prism having at least three optically flat
 surfaces, with an exit surface also serving as a
10 totally reflecting surface,
 a second prism having at least two optically
 smooth surfaces,
 a third prism having at least three optically
 smooth surfaces, and
15 a fourth prism having at least two optically
 smooth surfaces,
 two dichroic films which reflect different color
 light beams are arranged between said first and second
 prisms and between said third and fourth prisms so as
20 not to cross each other.

17. A system according to claim 6, wherein $0.07 < L/f < 0.35$ is satisfied, where L is a diagonal length of an image display portion of said image modulation
25 means, and f is a focal length of said positive
 refracting optical element.

18. A system according to claim 9, wherein an angle θ_1 defined by a surface of said color combining prism which is located on an exit side and on which a dichroic film is formed and an exit surface of said color combining prism satisfies

$$20^\circ < \theta_1 < 35^\circ$$

19. A system according to claim 9, wherein an angle θ_2 defined by an exit surface of said color combining prism and a surface of said color combining prism which is located on an incident side and on which a dichroic film is formed satisfies

$$40^\circ < \theta_2 < 50^\circ$$

20. A system according to claim 6, wherein a focal length of at least one of said plurality of positive refracting optical elements is different from focal lengths of said remaining positive refracting optical elements.

21. An image projection optical system comprising:
said color combining optical system defined by claim 1, which color-synthesizes a plurality of light beams from a plurality of image modulation means; and
a projection optical system for enlarging/projecting combined image light from said color combining optical system.

22. A system according to claim 21, wherein
|Lin/L| > 4 is satisfied, where Lin is a distance from
an incident pupil of said entire overall image
projection optical system including said projection
5 optical system, said color combining prism, and said
positive refracting optical element to a display
portion of said image modulation means, and L is a
diagonal length of the image display portion of said
image modulation means.

10 23. A projection type image display apparatus
comprising:

a color separation optical system for
color-separating light from a light source into a
15 plurality of color light beams;

a plurality of image modulation means illuminated
with the plurality of color light beams;

said color combining optical system defined by
claim 1, which color-combines a plurality of color
20 light beams from said plurality of image modulation
means; and

a projection optical system for
enlarging/projecting combined image light from said
color combining optical system.

25 24. A projection type image display apparatus
comprising:

a color separation optical system for
color-separating light from a light source into a
plurality of color light beams;

a plurality of image modulation means illuminated
5 with the plurality of color light beams; and

said color combining optical system defined by
claim 21, which color-combines a plurality of color
light beams from said plurality of image modulation
means and enlarges/projects the combined light.